

# A NEW INTERGENERIC WOOD WARBLER HYBRID (*PARULA AMERICANA* × *DENDROICA CORONATA*) (AVES: FRINGILLIDAE)

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*Abstract.*—A new intergeneric wood warbler hybrid (*Parula americana* × *Dendroica coronata*) is described from a male in first basic plumage taken during fall migration on the Gulf coast of Florida. The hybrid is nearly intermediate between the parental species in plumage pattern and color, but is more similar to its smaller parent, *P. americana*, in size and shape.

When Gray's compendium of avian hybrids was published in 1958, eight hybrid combinations (according to the latest taxonomy, (American Ornithologists' Union 1983) had been reported among wood warblers (Fringillidae: Parulinae). Since then the number of hybrids has more than doubled: no fewer than 20 hybrid combinations, nine of them intergeneric, are now known (Bledsoe 1988, Graves, unpubl.). The purpose of this paper is to describe a previously unreported intergeneric hybrid wood warbler.

The late Henry M. Stevenson collected an unusual hybrid wood warbler on St. George's Island, Franklin County, Florida, on 24 October 1970. Stevenson's penciled notation on the specimen label (Tall Timbers Research Station No. 2881) identified it as a hybrid, *Parula americana* × *Dendroica coronata*. Here I confirm Stevenson's identification and present a diagnosis of the hybrid specimen.

## Materials and Methods

The specimen, sexed as a male, has narrowly pointed rectrices and dull, weakly patterned plumage, indicative of first basic plumage in the Parulinae (Pyle et al. 1987). I compared it with series of immature males in first basic plumage of all North American species of wood warblers that breed in the United States and a specimen of the hybrid, *Parula americana* × *Setophaga ruticilla*, in

the National Museum of Natural History, Smithsonian Institution. Measurements of wing chord, wing tip length (longest primary minus longest secondary), tail length (from point of insertion of central rectrices to tip of longest rectrix), tarsus length, and bill length (from anterior edge of nostril), were made with digital calipers to the nearest 0.1 mm. Color comparisons were made under Examolites (Macbeth Corp.).

Diagnostic assumptions and methods of hybrid diagnosis based on plumage color and pattern and external morphology follow Graves (1990). Although the specimen was collected in coastal Florida, I considered all migratory species of wood warblers as potential parents of the hybrid. The analysis followed a two-step procedure. First, the presumed parental species of the hybrid were determined by the comparative analysis of plumage pattern and color. This hypothesis was then examined with morphometric data. Concordance of results are interpreted as strong support for the presumed parentage of the hybrid (see Graves 1990, Graves & Zusy 1990).

I used principal components analysis (PCA) on untransformed variables to reduce dimensionality of data and to facilitate the analysis of morphology in two dimensions. Unrotated principal components were extracted from correlation matrices (SYSTAT).



Fig. 1. Dorsal view of *Parula americana* (left), a presumed *P. americana* × *D. coronata* hybrid (Tall Timbers Research Station No. 2881), and *Dendroica coronata* (right).

## Results

**Plumage characters.**—Prominent pattern elements possessed by the hybrid include: (1) a semiconcealed coronal patch; (2) short superciliary and subocular spot; (3) wing bars

(contrasting tips of the greater and middle wing coverts); (4) spots on two outermost pairs of rectrices (rectrix 5 and 6); and (5) dark streaks on the flanks and sides of the breast. Distinctive color characters of the hybrid include: (1) gray dorsal plumage with



Fig. 2. Lateral view of *Parula americana* (left), hybrid *P. americana* × *D. coronata*, and *Dendroica coronata* (right) (see Fig. 1).

a triangular olive-brown patch on the mantle; (2) pale ventral plumage with a yellowish wash on the breast; (3) buffy or pale chestnut spots on breast and sides of lower breast; (4) buffy flanks with blackish shaft streaks; (5) pale lower mandible (in dried

skin); and (6) brownish-black legs (in dried skin) (Figs. 1-3).

The pool of potential parental species can be quickly reduced by concentrating on characters that the hybrid shares with just a few species. Of the many possible color



Fig. 3. Ventral view of *Parula americana* (left), hybrid *P. americana* × *D. coronata*, and *Dendroica coronata* (right) (see Fig. 1).

and plumage characters present in the hybrid, only one appears to be synapomorphic (shared derived)—the olive mantle which contrasts with the neutral gray dorsal plumage. Among the potential parental species this character is shared only with *Parula*

*americana* and the largely sedentary *P. pityayumi* of southern Texas. Phenotypic expression of this pattern element has also occurred in other hybrids of *P. americana* (*P. americana* × *Setophaga ruticilla*, see Burleigh 1944; *P. americana* × *Dendroica*

Table 1.—Ranges and means ( $\pm$ one standard deviation) of measurements of fall juvenile male *Parula americana*, *Dendroica c. coronata*, and the hybrid (Tall Timbers Research Station No. 2881).

Character	<i>P. americana</i> (n = 10)	<i>D. coronata</i> (n = 10)	Hybrid
Wing chord	55.4–62.0	66.2–74.4	64.7
	60.1 $\pm$ 2.1	70.9 $\pm$ 2.5	
Wing tip	12.1–16.9	15.6–19.8	14.2
	14.6 $\pm$ 1.9	17.1 $\pm$ 1.2	
Tail	39.9–46.5	51.0–58.6	44.7
	43.4 $\pm$ 2.0	55.4 $\pm$ 2.3	
Tarsus	16.3–17.9	17.3–19.4	16.3
	16.9 $\pm$ 0.5	18.2 $\pm$ 0.7	
Bill	7.2–8.2	6.5–7.8	8.0
	7.7 $\pm$ 0.3	7.1 $\pm$ 0.4	

*dominica*, see Haller 1940). Other characters of the hybrid that are shared with *P. americana* include whitish superciliary and subocular spot, yellowish wash across the breast, small buffy or chestnut spots on the breast and sides of the lower breast, pale unmarked belly and undertail coverts, white tail spots (rectrix 5 and 6), well-developed wing bars, and pale lower mandible.

By a process of elimination, the remaining diagnostic characters of the hybrid, including its streaked buffy flanks, concealed pale coronal spot, and dark legs, must have been contributed by the other parental species. Among wood warblers in first basic plumage, a well-developed white or yellow coronal spot, similar to that possessed by the hybrid, is present in *Dendroica coronata* and to a lesser extent in *D. fusca* and *D. cerulea*. *Dendroica fusca* can be discarded as a parental choice because the hybrid lacks traces of the dark yellow or yellowish-orange superciliary and throat found in that species. Several other wood warblers have yellow crowns or concealed coronal spots (*Vermivora pinus*, *V. chrysoptera*, *Dendroica virens*, and *D. occidentalis*) or a central crown stripe (*Mniotilla varia*) that could potentially produce a hybrid with a semiconcealed whitish coronal spot. None of the

Table 2.—Factor loadings for the first two principal components from analysis of males in first basic plumage of *Parula americana*, *Dendroica c. coronata*, and the hybrid (see Fig. 4).

Variable	Principal component axes	
	I	II
Wing chord	0.96	-0.02
Wing tip	0.87	0.08
Tail	0.94	0.02
Tarsus	0.78	0.51
Bill	-0.71	0.66
Percent variance explained	73.5	13.9

aforementioned species, however, with the exception of *D. coronata*, has dark buffy flanks with blackish shaft streaks. The predominately white throat and restricted distribution of white tail spots in the hybrid suggest the eastern subspecies, *D. c. coronata*.

In sum, plumage characters of the hybrid can be accounted for by the two most probable parental species, *Parula americana* and *Dendroica coronata* (see Appendix). Other pairs of species lack the range of pattern elements and plumage colors exhibited by the hybrid and, barring atavism or some unrecognized genetic phenomenon, could not have produced the hybrid.

*External morphology.*—The hypothesis of parentage derived from plumage characters was tested with an analysis of morphological size and shape. Because size and shape characters are presumably controlled by many genes, the mensural dimensions of the hybrid are expected to fall within the cumulative ranges of parental characters. Four of the five measurements of the hybrid fall within the range of those for *Parula americana*, but all five are outside the ranges for *Dendroica coronata* (Table 1). Thus, the hybrid is much more nearly the size and shape of *P. americana*, the smaller of the two presumed parental species. The bill of the hybrid is intermediate in structure between the long, rather slender bill of *P.*

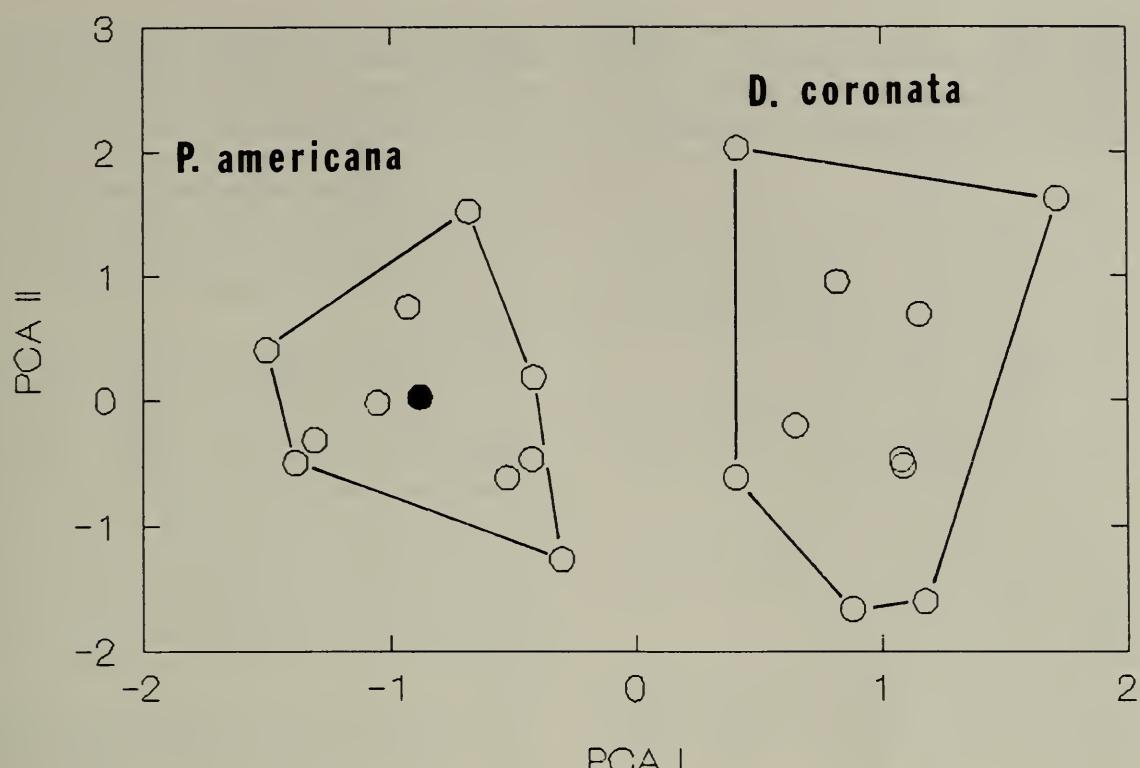


Fig. 4. Bivariate plot of factor scores from a principal components analysis of measurements of *Parula americana*, *Dendroica coronata*, and their presumed hybrid (filled circle).

*americana* and the shorter, wider bill of *D. coronata*.

The morphological similarity of the hybrid to *P. americana* is further demonstrated by a principal components analysis (Fig. 4, Table 2). Factor scores of the hybrid fall within the envelope of those for *P. americana*. Under the assumptions used here (Graves 1990), had the hybrid's factor scores occurred outside the region of multivariate space circumscribed by the combined scores of the presumed parental species, the *P. americana* × *D. coronata* hypothesis could have been rejected—provided that the PCA axes described a large percentage of the total variance and samples of the parental species were large. Although this interpretation seems to be confirmed by a few case studies of avian hybridization (Graves 1988, 1990, 1992), this method has not been tested with large samples of hybrids of known parentage (e.g., *Vermivora pinus* × *V. chrysoptera*).

In conclusion, the parentage of the hybrid can be attributed, with a high degree of certainty, to *Parula americana* and *Dendroica*

*c. coronata*. The breeding ranges of these two species overlap extensively from western Minnesota and Ontario east through the Great Lakes to the northern Appalachians and the maritime provinces of Canada.

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#### Literature Cited

- American Ornithologists' Union. 1983. Check-list of North American birds, 6th ed. A.O.U., Washington, D.C., 877 pp.
- Bledsoe, A. H. 1988. A hybrid *Oporornis philadelphicus* × *Geothlypis trichas*, with comments on the taxonomic interpretation and evolutionary significance of intergeneric hybridization.—Wilson Bulletin 100:1–8.
- Burleigh, T. D. 1944. Description of a new hybrid warbler.—Auk 61:291–293.
- Graves, G. R. 1988. Evaluation of *Vermivora* × *Opo-*

*rornis* hybrid wood-warblers.—Wilson Bulletin 100:285–289.

—. 1990. Systematics of the “green-throated sunangels” (Aves: Trochilidae): valid taxa or hybrids?—Proceedings of the Biological Society of Washington 103:6–25.

—. 1992. Diagnosis of a hybrid antbird (*Phlegopsis nigromaculata* × *Phlegopsis erythropetra*) and the rarity of hybridization among suboscines.—Proceedings of the Biological Society of Washington 105:834–840.

, & R. L. Zusi. 1990. An intergeneric hybrid hummingbird (*Heliodoxa leadbeateri* × *Helianzelus amethysticollis*) from northern Colombia.—Condor 92:754–760.

Gray, A. P. 1958. Bird hybrids. Commonwealth Agricultural Bureaux, Bucks, England, 390 pp.

Haller, K. W. 1940. A new wood warbler from West Virginia.—Cardinal 5:49–53.

Pyle, P., S. N. G. Howell, R. P. Yunick, & D. F. DeSante. 1987. Identification guide to North American passerines. Slate Creek Press, Bolinas, California, 278 pp.

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#### Appendix

Comparative descriptions of the hybrid, *Parula americana* × *Dendroica c. coronata*, and its parental species in first basic plumage (males) (see Figs. 1–3).

The crown, hindneck, mantle, and scapulars of *coronata* are dark brown; central crown feathers are subterminally yellow, forming a semiconcealed coronal patch; feathers of the mantle and scapulars have blackish shaft streaks. In *americana*, the respective parts are gray; feathers of the crown, hindneck, and scapulars are lightly tipped with olive yellow; the mantle is dark olive yellow forming a triangular patch that contrasts with the adjacent grayish plumage. Crown feathers of *americana* lack subterminal spots although the basal portion of the feathers near the rachi are pale. The respective parts of the hybrid are intermediate in appearance; feathers of the crown, hindneck, and scapulars are gray, faintly tipped with brownish-olive; crown feathers possess white subterminal spots with scattered yellow barbs; the mantle, which contrasts noticeably with the adjacent grayish plumage, exhibits a contrasting patch of pale olive brown plumage with faint darker shaft streaks (contrast between the gray hindneck and olive mantle of *P. americana* and the hybrid appears indistinct in Fig. 1).

In *coronata*, the lower back is brownish gray with darker shaft streaks, the rump is pale yellow, and the upper tail coverts are black with broad dark gray margins. The lower back, rump and upper tail coverts in *americana* are gray, faintly tipped with olive yellow. The hybrid is intermediate in appearance; the lower back is gray with dark shaft streaks; feathers of the rump exhibit olive yellow tipping; the upper tail coverts are black with broad gray margins tinted with olive yellow.

The superciliary region of *coronata* is slightly paler than the dark brown crown; the broken eyering is buffy white; the lores and auriculars are dark brown; the neck is slightly paler. In *americana*, the short superciliary is yellowish white anteriorly, turning white over the eye; the subocular spot is white (this and the superciliary form a broken eyering); the lores, auriculars, and neck are gray. The hybrid is intermediate; the superciliary and subocular spot are dull white; the lores, auriculars and neck are gray (superciliary somewhat obscured in Fig. 2).

In *coronata*, the chin and throat are buffy white; the breast, sides, and flanks are buffy white to buff with dark brown or black shaft streaks; margins of feathers at the side of the breast are pale yellow; the belly, vent and undertail coverts are white. The chin and throat of *americana* are yellow; feathers of the lower throat and pectoral area are dark brown to chestnut brown with yellow margins; the pectoral area is bordered posteriorly by an unmarked yellow band; the sides and flanks are pale gray suffused with pinkish buff feathers that are occasionally tipped faintly with olive yellow; a few buff or chestnut spots occur below the unmarked yellow breast band; the belly, vent, and undertail coverts are white, tinted with olive yellow near the vent. The venter of the hybrid is somewhat intermediate but marked less than either of the parental species. The chin and throat are white tinted with pale yellow; the breast is very pale yellow, some feathers have buffy or pale chestnut subterminal spots; feathers at the sides of the breast (near the bend of the wing in the specimen) have black shaft streaks; the sides and flanks are buffy with dark shaft streaks; the lower breast, abdomen, vent, and undertail coverts are white; a few buffy spots occur on the sides of the lower breast.

The remiges and wing coverts are dark grayish brown in *coronata*; greater and middle wing coverts are broadly tipped with buffy white or buff; outer webs of remiges are margined with buff or grayish-brown. In *americana*, the remiges and wing coverts are gray; greater and middle wing coverts are broadly tipped with white; remiges have olive-tinted gray margins. The remiges and wing coverts of the hybrid are nearly intermediate in color and pattern.

Rectrices of *coronata* are dark brown with progressively larger white spots on the inner webs of rectrix four, five, and six. In *americana*, the white area on

rectrix four is limited to a thin stripe along the margin of the inner web. The tail pattern of the hybrid is intermediate; rectrix four is similar to that of *americana*, while the two outer pairs of rectrices (5 & 6) are nearly identical to those of *coronata*.

The bill of *coronata* is dark brownish black (in dried

skins). In *americana*, the bill is yellowish-brown, darker near the nostrils and along the culmen. Bill color of the hybrid is intermediate. Leg color is blackish-brown in *coronata* and the hybrid and medium brown in *americana*.